ORDER

6850.27

REMOTE (RADIO) CONTROL SYSTEM
PROJECT IMPLEMENTATION PLAN

March 25, 1988

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

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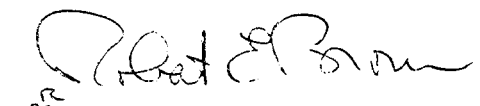
FOREWORD

This project implementation plan provides management direction for the implementation and acceptance of the Remote (Radio) Control System (RRCS) into the National Airspace System (NAS). It defines the major functional responsibility levels, management direction, and overall program guidance to all responsible levels within the FAA for the procurement and implementation of the Remote (Radio) Control System.



for James R. Etgen
Director, Program Engineering Service

Table of Contents

Table of Contents (Cont'd)

FIGURES

Table of Contents (Cont'd)

CHAPTER 1. GENERAL

1. PURPOSE. This project implementation plan (PIP) provides technical guidance and management direction for the implementation of the Remote (Radio) Control System (RRCS). The PIP establishes program management, project implementation policy, and responsibilities governing the activities of organizations. The PIP is organized and presented as per FAA-STD-036, Preparation of Project Implementation Plans.

2. DISTRIBUTION. This order is distributed to: branch level in the Program Engineering Service; division level in the Systems Maintenance, Systems Engineering, Office of Flight Standards, Office of Programs and Regulations Management, Air Traffic Operations, Air Traffic Plans and Requirements, Automation Service, Acquisition and Materiel, Office of General Counsel, and Office of Budget in Washington Headquarters; to branch level in the regional Airway Facilities, Air Traffic, Flight Standards and Logistics divisions; and to division level at the Facility Support Division, FAA Academy and FAA Depot at the Mike Monroney Aeronautical Center; and to Airway Facilities sector field offices, sector field units and sector field office units.

3. AUTHORITY TO CHANGE THIS ORDER. The Director, Program Engineering Service shall approve all changes to this order.

4.-19. RESERVED.

CHAPTER 2. PROJECT OVERVIEW

20. SYNOPSIS. As a result of the FAA's examination of the present visual guidance lighting system, the FAA found it necessary to under go a multi-year program to provide safety related facilities and enhancements to visual guidance lighting systems. The visual guidance lighting program includes the replacement or establishment of remote radio controls for visual aids to meet the operational requirements of air traffic controllers and remove complex coding requirements. The remote radio control system will permit single-button control of each visual aid function.

21. PURPOSE. The purpose of the RRCS is to provide independent operation and control from the air traffic control tower (ATCT), Automated Flight Service Station or Flight Service Station for FAA installed visual aid systems. The RRCS program supports a FAA effort to reduce the expense of installing new cabling from lighting systems to the air traffic control tower; to standardize and reduce the cost of equipment maintenance; and to provide a system that improves the man-machine interface between the controller and the lighting equipment.

22. HISTORY.

a. During the late 1960's and early 1970's, most visual aid systems were indirectly controlled by photoelectric devices and/or by sensing the runway edge lighting circuit. It was determined in July, 1975 that control of some visual aids must be established at the ATCT. Presently, some visual aid lighting system equipments are linked to FAA ATCT facilities by remote radio control. In 1975 however, a number of visual aids had no remote control from the ATCT. With the FAA determination that remote control of certain visual aids was required, a program was implemented to install Motorola 504 remote radio control systems for all MALSR; other visual aids were also allowed to be remote controlled as justified by the regions on a site by site determination. In 1980, Motorola stopped manufacturing the 504 remote radio control system. The FAA, because the air traffic controllers had submitted many unsatisfactory condition reports, developed a new specification to purchase new remote radio control systems. The new specification FAA-E-2723, Remote (Radio) Control System, meets air traffic controller requirements. This new RRCS is being installed at visual aid establish sites starting in FY-1980 and all remote radio control retrofit sites starting in FY-1987.

b. The specification FAA-E-2723 was baselined, and the project budgeted under specific visual aid facilities and set aside for an 8A contractor. Sonicraft, Inc. of Chicago, Illinois, received the contract on July 13, 1984.

c. The equipment contract (budgeted for in FY 80, 81, 82 and 83) called for design, testing, production, and engineering support services. The contract will provide equipment for the installation at establish visual aid sites of 262 Remote (Radio) Control Systems. In August 1987, the first RRCS unit was installed at the FAA Technical Center in Atlantic City, New Jersey, where system testing of the RRCS by the contractor, representatives from FAA/APS-440 and FAA/ACT-130, and SEIC/SCT was completed. The first system was delivered to the FAA Depot on December 11, 1987.

d. The FY-84 and FY-85 budget requirements for the RRCS were contracted for on October 15, 1985 from Sonicraft, Inc. and called for delivery at establish visual aid sites of 225 RRCSs commencing in April of 1988.

e. The FY-86 and 87 budget requirement for the RRCS establish visual aid sites program is for a production of 250 units. Delivery for this phase of the program is projected to be completed in March 1991.

f. Implementation of the RRCS under all three contracts is to continue through 31 December, 1992.

g. The FY-87 budget item 4c(12)NP for Retrofit Visual Aid Remote Radio Control System was not funded. This requirement was placed in the FY-88 and FY-89 budget call for estimates.

23.-29. RESERVED.

CHAPTER 3. PROJECT DESCRIPTION

30. FUNCTIONAL DESCRIPTION.

a. The RRCS is the implementation of remote radio control for MALS, MALSF, MALSR, ODALS, REIL, PAPI, and VASI. The RRCS consists of a switch assembly cabinet with mounting facilities for holding five switch assembly panels and an encoder unit which translates the operation of push button switches on the switch assembly panel into unique serial data codes and a unique facility code for each push button actuated. These signals are then fed into an encoder interface unit which employs frequency shift keying (FSK) to translate the digital signals into voice frequency tones. These tones are passed to a FM transmitter, modulate the carrier, and are then delivered to a FM receiver installed in the proximity of a specific visual aids facility. There the received signal is demodulated and converted back to a digital signal. The signal is then passed to decoder equipment which converts the signal to the proper control signal and then transmits it to the remote radio control interface unit.

b. It should be noted that a separate interface unit as specified an FAA-E-2663 must be used to interface the RRCS with each lighting subsystem. This unit converts the DC and AC signals received from the decoder into 120VAC signals to operate and control the specified lighting subsystem. Air-to-ground control capability for visual aids is provided by interfacing the air-to-ground receiver controller with the same interface unit.

c. Figure 3-1a and 3-1b block diagrams show the RRCS and the visual aid facilities.

d. Figure 3-2 is a diagram of the switch assembly cabinet with switch assembly panels installed.

31. PHYSICAL DESCRIPTION.

a. Switch Assembly Cabinet. The switch assembly cabinet is located in the control facility and functions as a central point of control and operation for FAA installed lighting subsystems. The switch assembly cabinet is 9-1/2 X 9 X 8 inches in dimension, and houses four types of switch assembly panels, 1-1/2 X 9 inches, which contain push button switches for remotely operating and controlling the visual aid lighting systems below. In addition to the switch assembly panels, the switch assembly cabinet houses the encoder unit, a mother board and its connector for connecting signals and power to the encoder interface unit.

(1) TYPE I. Controls the medium intensity approach lighting system with runway alignment indicator lights (MALSR), medium intensity approach lighting system with sequenced flashing lights (MALSF) and medium intensity approach lighting system (MALS).

(2) TYPE II. Controls the omnidirectional approach lighting system (ODALS).

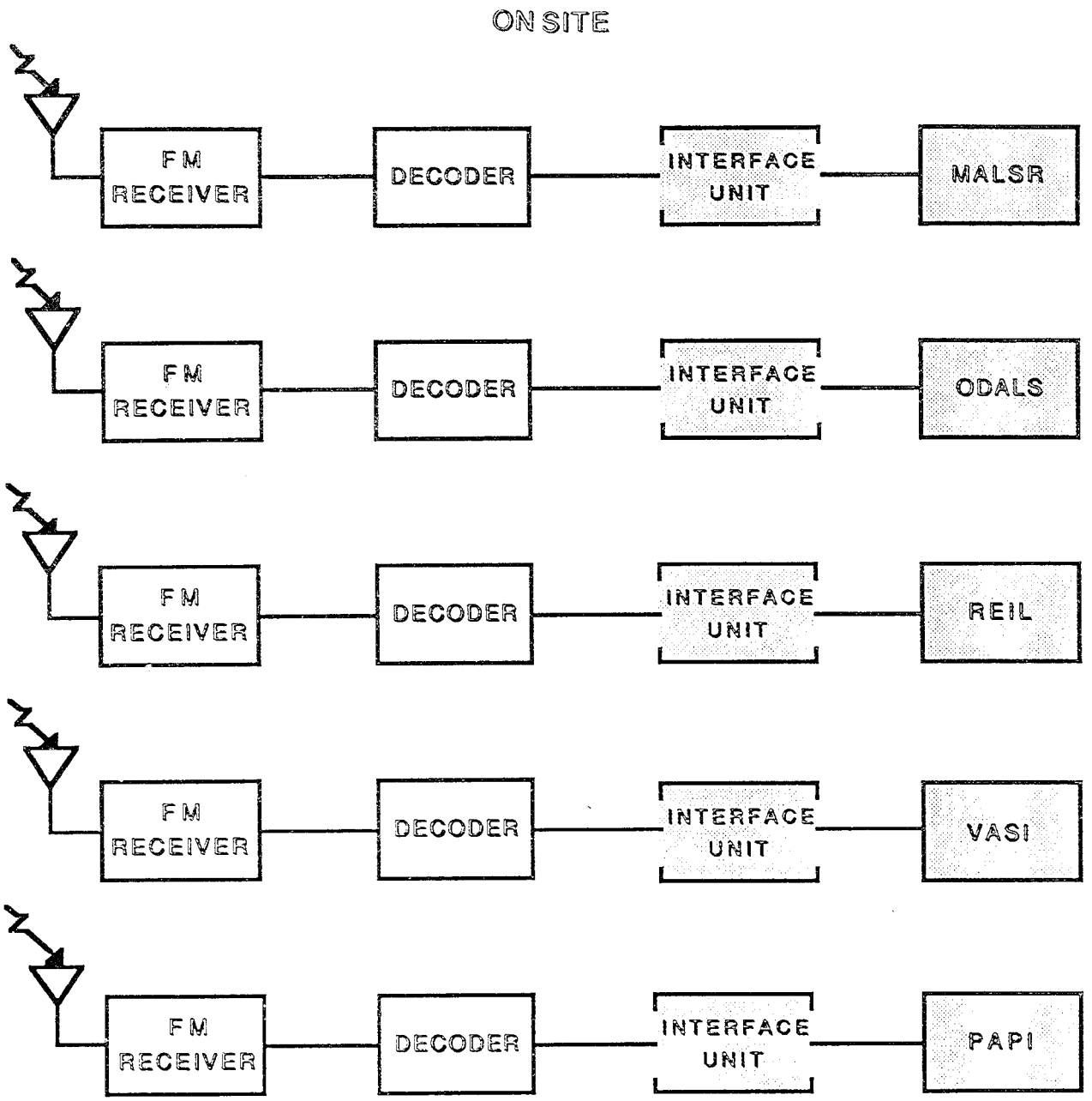


FIGURE 3-1a. REMOTE RADIO CONTROL SYSTEM SITE CONFIGURATIONS

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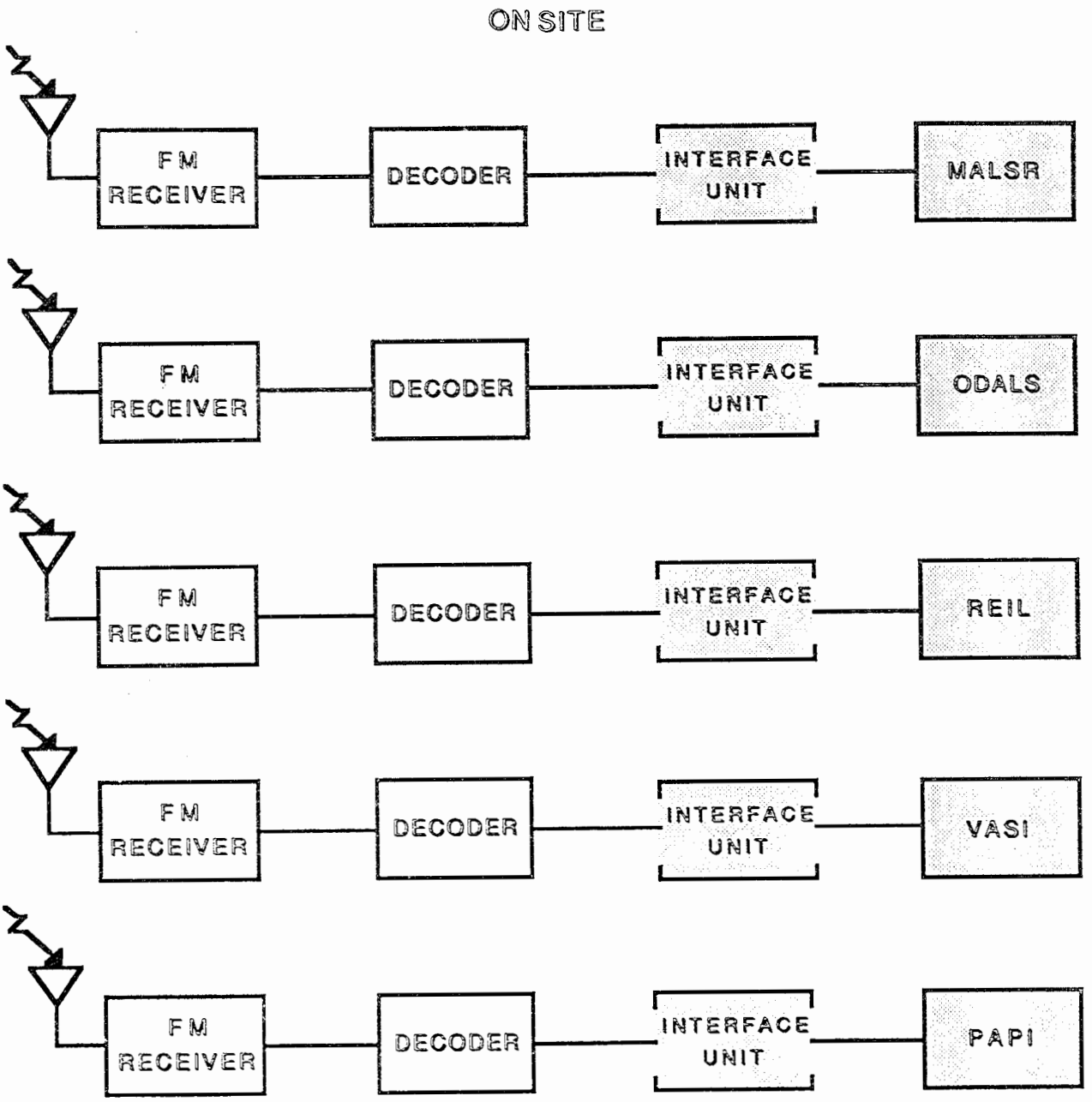

FIGURE 3-1a. REMOTE RADIO CONTROL SYSTEM SITE CONFIGURATIONS

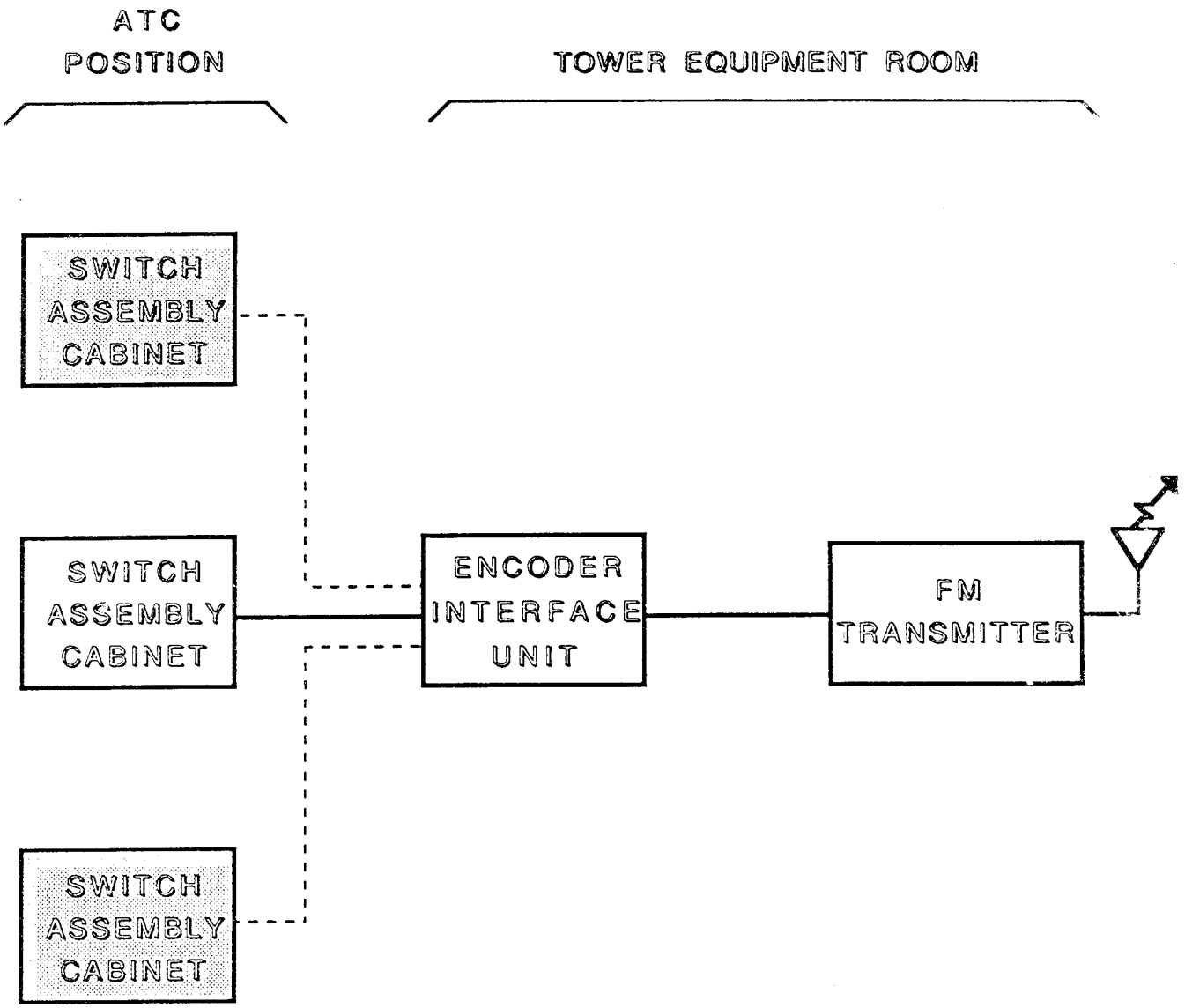

FIGURE 3-1b. REMOTE RADIO CONTROL SYSTEM TOWER CONFIGURATION

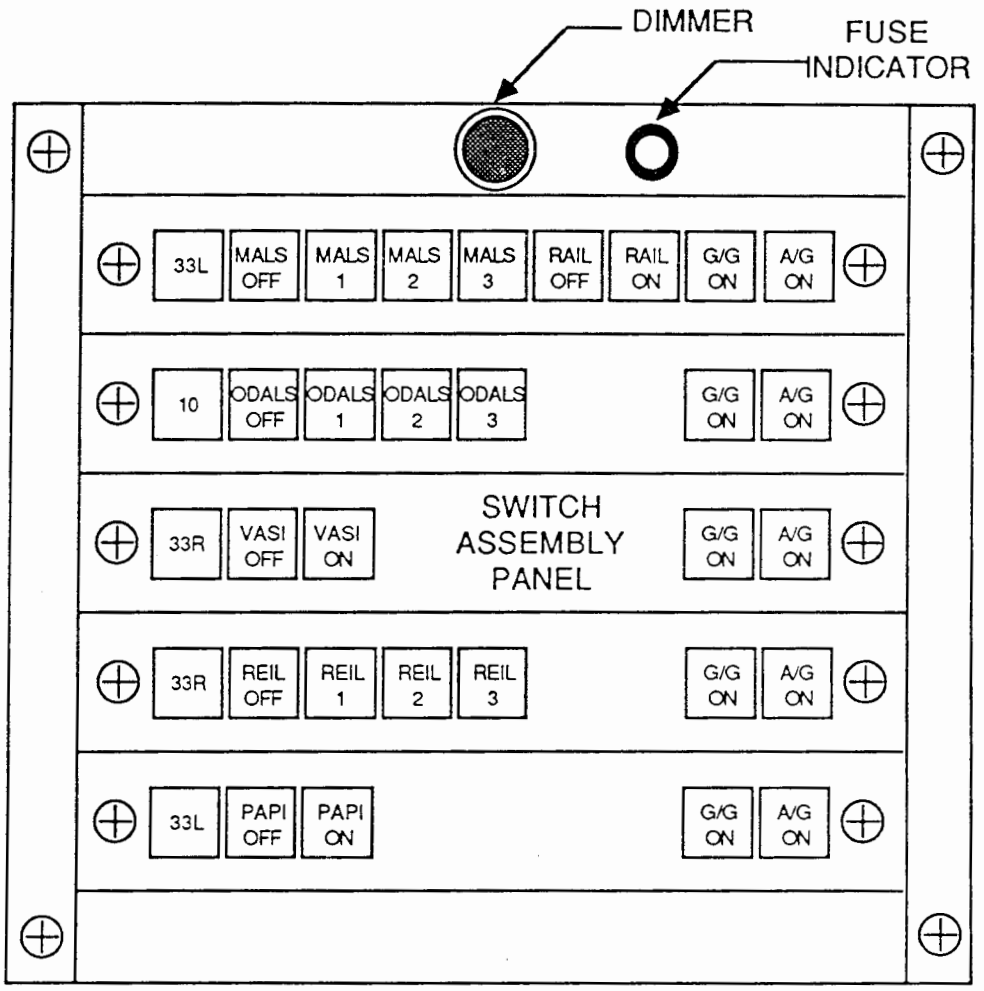

FIGURE 3-2. SWITCH ASSEMBLY CABINET

(3) TYPE III. Controls the runway end identifier lights (REIL).

(4) TYPE IV. Controls the visual approach slope indicator system (VASI) or the precision approach path indicator (PAPI) system.

b. Encoder Interface Unit. The encoder interface unit has a height of approximately 9 inches and is designed to mount onto a standard 19-inch rack located in the ATCT equipment room. The interface unit accepts signals from a maximum of three switch assembly cabinets and delivers them as voice frequency signals to the FM transmitter. The encoder interface unit also contains the tone generator and circuitry to turn the transmitter on during transmission and off at the conclusion of transmission.

c. FM Transmitter. The FM transmitter has a height of approximately 9 inches and is installed in a standard 19-inch relay rack in the control facility equipment room. After accepting signals from the encoder interface unit, it delivers a modulated 1 to 2.5 watt FM signal to a standard quarter-wave VHF whip antenna for transmission to the FM receiver.

d. FM Receiver. The FM receiver is installed in close proximity to the visual aid facility in a dust-tight, airtight, waterproof cabinet equipped with a quarter-wave whip antenna. After accepting the transmitted signal, it demodulates the signal and provides the output to the decoder unit via one of two 1-inch conduit hubs on the bottom of the cabinet.

e. Decoder. The decoder is also installed in a dust-tight, airtight and waterproof NEMA-12 cabinet in close proximity to the visual aid facility. It has two 1-inch conduit hubs on the bottom of the cabinet for power and signal lines.

f. Radio Remote Control Interfacing Unit. The interface unit, which uses signals received from the decoder to control the visual aids, is installed between the decoder and the visual aid in an outdoor, rainproof, dust proof, non-ventilated cabinet with lightning arrestors connected to the power inputs and also to the control input leads from the A/G unit.

32. SYSTEM REQUIREMENTS. RRCS requirements include power, reliability, maintainability and interchangeability. Modularity, and spectrum support are also design considerations of the system.

a. Power Requirements. The remote radio control system equipment operates on commercial power sources (120 +/- 18VAC, 60Hz), or from power derived from commercial power sources for subsystems. The system is designed to prevent a restart in a undefined state after interruption of primary power either at the lighting subsystem or control facility. In addition, the system provides protection from repeated transient increases in the 120VAC line voltage superimposed on the AC power line voltage waveform for inside equipment and protection from repeated transients applied at the power and control signal inputs at the output lines for outdoor equipment. Table 3-1 contains subsystem power requirements.

b. Modularity. All electronic, electrical, and mechanical components are designed and constructed to minimize the skill, experience, and time necessary to disassemble, assemble and maintain them. All electronic circuits are

designed using plug-in printed wiring boards except where high voltage or high power devices are utilized. Similar functions are performed using identical modules wherever practical, and preference is given to designs which afford component replaceability.

c. Interchangeability. All parts of each system are interchangeable between systems, and identical parts within each system are interchangeable.

d. Maintainability. The switch assembly panels, switch assembly cabinet, encoder, encoder interface unit, and power supply as a subsystem as well as the decoder, FM transmitter and FM receiver have an analytically determined mean time to repair (MTTR) of 15 minutes and a maximum repair time of 30 minutes.

e. Reliability. The analytically determined reliability of these subsystems, except for the transmitter and receiver, is 20,000 hours for the upper test mean time before failure (MTBF) and 10,000 hours for the lower test mean time before failure. The transmitter and receiver have a lower MTBF of 5,000 hours and an upper MTBF of 10,000 hours.

f. Spectrum Support. The FM transmitter provides single-channel operation in the 162 to 174MHz frequency band with a +/- 3KHz deviation of the FM carrier (equivalent to 100 percent modulation) at an output power of 1 to 2.5 watts into a 50 ohm impedance. Spurious and harmonic emissions are no greater than 50 microwatts, or more than 43dB + 10 log (P)ower below carrier. Frequency stability is +/- 0.0005 percent of reference frequency in ambient temperature ranging from -30 degrees centigrade to +60 degrees centigrade, and +/- 0.0005 percent with a 20 percent primary voltage deviation. (Type 15 F2 modulation as specified in FCC Rules and Regulations, Volume II, Part II provides the required +/-3KHz deviation for 100 percent modulation in the 162 to 174MHz band). The transmitter and receiver meet NTIA and FCC requirements for fixed base operation. All RRCS systems are factory aligned to 165.7625 MHz.

33. INTERFACES. At airports manned by air traffic control on less than a full time basis, the air-to-ground (A/G) unit operates when selected by the ground-to-ground (G/G) unit allowing aircraft pilots to operate the visual aid system from the air. Interface of the A/G unit with the RRCS will be through the radio remote control interface units provided with the visual aid. In the NAS end state design, the RRCS will interface with the Tower Control Computer Complex (TCCC) at those ATCTs so equipped.

34.-39. RESERVED.

EQUIPMENT	INPUT POWER	OUTPUT POWER	REMARKS
Switch Assembly Cabinet	@24VDC unregulated	12 VDC	@From Encoder Interface Unit Power Supply
Encoder Unit	@12VDC	----	@ From Mother Board in the Switch Assembly Cabinet
Encoder Interface Unit	120 ± 18VAC, 60Hz	24VDC unregulated	Unit must be no more than 500 ft away from the Switch Assembly Cabinet
FM Transmitter	120 ± 18VAC, 60Hz	----	
FM Receiver	120 ± 18VAC, 60Hz	----	
Decoder	120 ± 18VAC, 60Hz @24VDC signal		@From Interface Unit
Interface Unit	120VAC, 60Hz	24VDC	

TABLE 3-1. POWER REQUIREMENTS

CHAPTER 4. PROJECT SCHEDULE AND STATUS

40. PROJECT SCHEDULE AND GENERAL STATUS. The procurement of the RRCS equipment is divided into the following contracts. FY-80 thru FY-83, DTFA01-84-Y-01023, is a production contract which will provide 262 RRCS systems for delivery to the depot. FY-84/85, DTFA01-86-Y-01000 is a production contract for the delivery of an additional 225 RRCS systems. A contract for FY-86/87 is scheduled to be awarded for an additional 250 units.

41. MILESTONE SUMMARY SCHEDULE. The current project schedule is shown as table 4-1. Project events are scheduled in relationship to the date of contract award. The dates listed are for those milestones completed or as anticipated from contractual requirements. This table is by no means the all inclusive list of project milestones necessary for project completion.

42. INTERDEPENDENCIES AND SEQUENCE. Delivery of the first complete RRCS to the regions is projected for April 1988 along with the PAPI system. The following projects were identified as having interdependencies with the RRCS project. Because of the broad variation in site requirements, discussion of specific effects of each program on a site-by-site basis is beyond the scope of this PIP.

a. The Airport Cable Loop Program. The Airport Cable Loop Program establishes a network with all of the airport's power and control cables. The RRCS will precede the Airport Cable Loop Program at some locations which might lead to their being dropped from control cable loops, although power cable loops may still be required.

b. The Airport Telecommunications Program. The Airport Telecommunications Program will establish the specifications and criteria for a reliable and flexible distribution system for low activity and medium activity airports. The Airport Telecommunications Program is related to all airport projects which require buried cable for control signals or communications between sites. The Airport Telecommunications Program investigates frequency interference and alternative communications media within the NAS plan. The RRCS impacts this program only in the landing area since the RRCS does require some buried cable for RRCS system to function. Remote Maintenance Monitoring System (RMMS) program will have to be considered on a case-by-case basis for each air facility affected.

c. The Remote Maintenance Monitoring System. The Remote Maintenance Monitoring System (RMMS) program has been developed to provide maintenance monitoring and control equipment for FAA facilities so that performance monitoring, certification, and control could be accomplished from centralized work centers. In many cases the RMMS program may not be fully implemented until some time after installation of the RRCS system has been completed. In these situations, the reduction in the frequency of onsite maintenance visits derived from the integration of the RRCS with the RMMS may not be realized until some time after the RRCS has been installed.

43.-49. RESERVED

EVENT	DATE
FY 80, 81, 82, 83	
Cost/Technical Review Completed	29 Jul 83@
Contract Award	13 Jul 84@
First System Delivered to Test & Eval. Site	28 Aug 87@
First System Delivery FAA (Depot)	11 Dec 87@
Last System Delivery FAA (Depot)	17 Jun 88
FY 84, 85	
Cost/Technical Review Completed	07 Jun 85@
Contract Award	15 Oct 85@
First System Delivery FAA (Depot)	29 Apr 88
Last System Delivery FAA (Depot)	30 Sep 88
FY 86, 87	
Cost/Technical Review Completed	01 Oct 87@
Contract Award	30 Jun 88
First System Delivery FAA (Depot)	30 Jan 90
Last System Delivery FAA (Depot)	30 Mar 91

@ Milestones Accomplished

TABLE 4-1 MILESTONE SUMMARY SCHEDULE

CHAPTER 5. PROJECT MANAGEMENT

50. PROJECT MANAGEMENT, GENERAL. This section describes the organizations within the Program Engineering Service (APS) that are directly responsible for RRCS program management.

a. Program Engineering Service (APS). The Program Engineering Service manages, directs, and executes the FAA's acquisition engineering and management activities related to facilities design, air navigation, landing aids, and air traffic control facilities and equipment to ensure that the NAS is efficient, economical, and responsive to operational needs.

b. Navigation and Landing Division (APS-400). The Navigation and Landing Division is the principal element of the Service responsible for the design, development, and implementation of systems, programs and facility requirements for navigation and landing systems.

c. Current Landing/Lighting Systems Program (APS-440). The Current Landing/Lighting Systems Program office is the principal element of the division responsible for design, development, and implementation responsibilities for instrument landing systems and landing aids.

d. Remote Radio Control System Program. The RRCS Program Manger is responsible for managing the design, development, and implementation activities associated with the RRCS. His duties include:

(1) Management. Planning, scheduling, and managing the RRCS Program from design through commissioning, logistics support, training, and program completion. Responsible for systems engineering, system design, man-machine interface, component design and related functional, technical, and performance characteristics.

(2) Equipment Provisioning. Provides, in conjunction with the Acquisition and Materiel Service and Systems Maintenance Service, technical guidance to define logistics support for proper provisioning of RRCS equipment.

(3) Modernization Input. Developing service input for the modernization or in-service improvement of RRCS equipment.

(4) Technical Officer. Providing engineering advice and consultation to the contracting officer during procurement, serving as technical officer, and reviewing contractor requests and progress payments.

(5) Cost Data. Developing and providing cost data, controlling assigned funds, and adjusting program schedules and objectives as necessary.

(6) Technical Installation Instructions. Preparing technical installation instructions.

(7) Maintenance Instructions. Preparing maintenance instructions, identifying training, provisioning and test requirements, and directing the preparation of maintenance technical handbooks.

(8) Testing. Reviews and approves manufacturers' equipment test procedures. Establishes requirements and approves plans for test and evaluation of RRCS engineering activities of the FAA Technical Center.

(9) Inventory. Manages in-transit material for construction and installation. Maintains currency of material systems and control over RRCS equipment inventory.

(10) Installation. Management of installation activities for current and future systems to assure a high level of system performance.

(11) Acceptance. Providing research, engineering, development, design and systems analyses associated with acquisition and acceptance of hardware and software.

51. PROJECT CONTACTS. This paragraph list RRCS project contacts and their addresses.

a. RRCS Cluster Manager. Al Thomas, APS-400, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS 267-8495, (202) 267-8488.

b. RRCS Program Manager. Frank Roepeke, APS-440, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS 267-8518, (202) 267-8518.

c. RRCS Project Engineer. Clesson McDonald, APS-440, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS 267-8495, (202) 267-8495.

d. RRCS SEIC Support. Dennis Hughes, SCT, DC1030, 475 School Street, S.W., Washington, D.C., 20024, (202) 646-5804.

52. PROJECT COORDINATION. The RRCS project coordinates with other services within the FAA and divisions within APS. Responsibilities are contained in this paragraph.

a. Maintenance Engineering Division (ASM-100). ASM-100 reviews RRCS procurement specifications to ensure the design meets the reliability and maintainability requirements and supports the general maintenance philosophy. ASM-100 also coordinates the development of an integrated logistic support plan for the RRCS system acquisition and develops maintenance standards and plans for implementation of maintenance concepts.

b. Maintenance Operations Division (ASM-200). ASM-200 participates in the development and review of RRCS maintenance plans. The program manager ensures the RRCS project is in conformance with staffing, training, and certification policies. In addition, ASM-200 develops national Airways Facilities sector staffing standards for the RRCS program and validates RRCS maintenance staffing requirements.

c. Materiel Management Division (ALG-200). ALG-200 directs the implementation of standards for the management and control of the RRCS material inventory and supply distribution systems.

d. Contracts Division (ALG-300). ALG-300 performs cost/price analyses of contractor's proposals and participates as a member of the Source Evaluation Board on RRCS procurements subject to the contracting officer. In addition, ALG-300 provides procurement support for the RRCS programs and plans, and places, and administers contracts for the RRCS equipment. ALG-300 also designates a contracting officer (CO) who is responsible for all contractual matters. The CO is the only individual authorized to approve contract changes impacting price, delivery or schedule.

e. Industrial Division (ALG-400). ALG-400 performs factory inspection of the RRCS. ALG-400 assigns a quality/reliability officer (QRO) at the time the RRCS contract is awarded. The QRO is the FAA's representative at the contractor's facility and is responsible for verifying quality control. The QRO is directed by FAA policy and procedure, and by the terms and conditions of the contract.

f. FAA Depot (AAC-400). AAC-400 accepts deliveries of RRCS systems from the manufacturer and manages the dissemination of RRCS systems at the regions request. AAC-400 is responsible for RRCS logistics support.

g. FAA Academy (AAC-900). AAC-900 provides maintenance training and coordinates with ASM-200 in the development of a training plan.

h. Technical Training Division (APT-300). APT-300 analyzes training proposals prepared by ASM-200 and initiates action to meet training requirements.

i. FAA Regional Office.

(1) The FAA regional office, through the established administrative structures, requests needed RRCS equipment. The FAA regional office coordinates with all responsible parties to assure adequate funding, establish system commissioning/service availability dates, assign project field representatives and determines utility availability.

(2) The FAA regional office assures proper compatibility and configuration for the facility installation of the visual aids which includes RRCS equipment. The FAA regional office coordinates the preparation, in advance, of site activities so as not to interfere with the availability of airport facilities.

(3) The FAA regional office provides field engineering as required to support preparations for the installation of RRCS equipment, orders government furnished materials (GFM), provides for tools and test instruments to support RRCS installation and acceptance; initiates work orders and travel authorization, and assigns field personnel.

(4) The FAA regional office coordinates the complete installation, alignment, and operational tests on the visual aid facility to assure full compliance with FAA specifications and performance.

(5) The FAA regional office conducts integration tests upon installation of the visual aid, which includes the RRCS, prior to JAI.

j. RRCS Contractor. The RRCS contractor, when requested by APS-440, provides engineering support services for onsite advice, including technical supervision to FAA technicians and the installation contractors concerning proper installation or operation of the RRCS.

k. Sector Office. The sector office assures that authorized sector office test equipment is available for the technician servicing the RRCS.

53. PROJECT RESPONSIBILITY MATRIX. Figure 5-1 illustrates the FAA organizations responsible for the implementation of each significant function of the RRCS project.

54. PROJECT MANAGERIAL COMMUNICATIONS. The RRCS program manager within APS-440 is the focal point for all internal project communication. Organizations supporting the RRCS program designate a representative to maintain close communication with the Current Landing/Lighting Systems Program office. Supporting organizations maintain communications with both the contractor and internally within the FAA. The meetings listed below are the regularly scheduled project meetings, or conferences.

a. The National Airspace Integrated Logistics Support (NAILS) Conference. These conferences are held to ensure that there is an interrelated, unified and iterative approach to the managerial and technical activities which support the National Airspace System (NAS). During these conferences issues effecting logistics management, maintenance planning, supply support, test and support equipment, manpower and training support, support facilities, technical data, and packing, handling, storage and transportation are discussed and resolved. These meeting are held on a semiannual basis at the FAA headquarters.

b. Program/Project Status Review Boards. These boards are held on a monthly basis at the FAA headquarters to discuss project status and to resolve problems and issues effecting all phases of the project from the time that the requirements are established until system deployment has been completed.

55. IMPLEMENTATION STAFFING. Not applicable.

56. PLANNING AND REPORTS. Not applicable.

57. APPLICABLE DOCUMENTS. Within this RRCS PIP the following documents have been referenced.

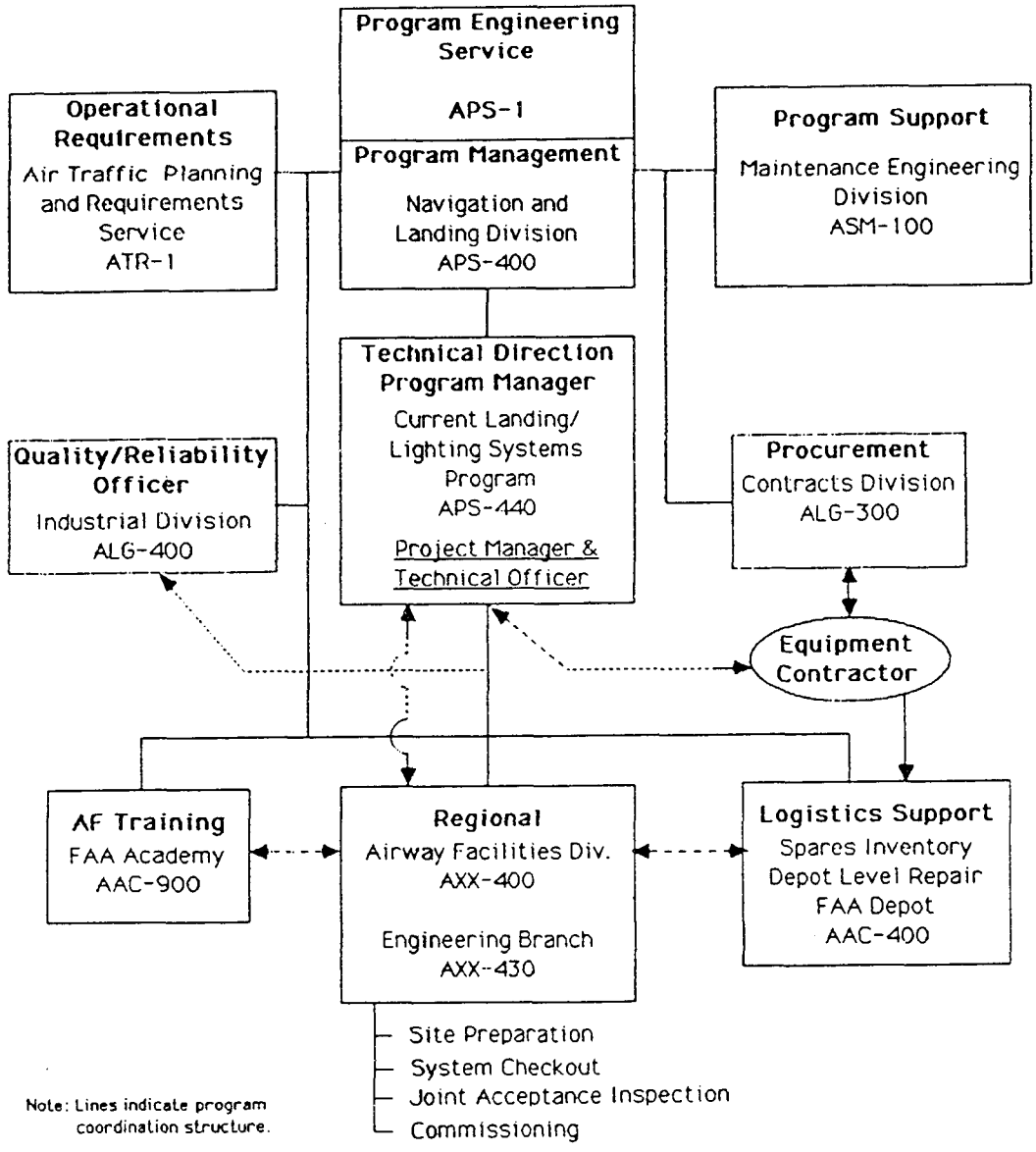

FIGURE 5-1. PROJECT RESPONSIBILITY MATRIX

a. Contract DTFA01-84-Y-01023, for Remote (Radio) Control Systems, July 13, 1984.

b. Contract DTFA01-85-Y-01055, for Remote Control Interface Units, September 16, 1985.

c. Contract DTFA01-86-Y-01000, for Remote (Radio) Control Systems, October 15, 1987.

d. FAA-E-2723, Remote (Radio) Control System, December 21, 1982.

e. FAA-E-2663, Interface Unit, MALSR Remote Control, November 18, 1976.

f. FAA Order 1800.8E, NAS Configuration Management, July 11, 1985.

g. FAA Order 6000.26A, Reliability and Maintainability Policy, May 14, 1982.

h. FAA Order 6030.45, Facility Reference Data File, February 11, 1987.

i. FAA Order 6200.4C, Test Equipment Management Handbook, September 16, 1985.

j. FAA Order 6850.2A, Visual Guidance Lighting Systems, December 17, 1981.

k. National Airspace System Plan, Facilities, Equipment, Associated Development and Other Capital Needs, April 1987.

l. NAS-SR-1000, System Requirements Specification, March 1985.

m. NAS-SS-1000, Functional and Performance Requirements for the National Airspace System, General, December 1986.

58.-59. RESERVED.

CHAPTER 6. PROJECT FUNDING

60. PROJECT FUNDING STATUS, GENERAL. There is no-budget line item for the RRCS. The RRCS covered by this PIP are funded as part of the individual visual aid establishment projects. The funds for the individual sites have been distributed to the regions and headquarters for each site. All established projects have been funded through FY-87.

61.-69. RESERVED.

CHAPTER 7. DEPLOYMENT

70. GENERAL DEPLOYMENT ASPECTS. Deployment of RRCS equipment is conducted by the FAA Depot at the Mike Monroney Aeronautical Center and the FAA regions upon approval from FAA Headquarters. As RRCS equipment becomes available, requests from the regions to satisfy RRCS requirements are honored by the depot. RRCS equipment is shipped by the FAA Depot to the site where it is stored for installation. Installation of the RRCS is the responsibility of the requesting FAA region. Table 7-1, depicts the Deployment Readiness Review (DRR) Schedule.

EVENT	DATE
DELIVERY TO FAATC	8/28/87
DRR REPORT DELIVERED	11/02/87
DRR BRIEFING TO ALG-2	11/13/87
1ST DELIVERY (DEPOT)	12/11/87

TABLE 7-1. RRCS (FY 80-83) DRR SCHEDULE

71. SITE PREPARATION. The regions are responsible for preparing the sites where RRCS equipment is to be located. The preparation at each site will be unique according to the type of implementation occurring. Implementation schemes consist of establishing systems at new locations. At locations where there is an existing ground-to-ground radio control system, there will be two separate ground-to-ground radio control systems after the RRCS is installed. The existing ground-to-ground radio control system will be removed under the RRCS Retrofit Program when funding from the budget is available. The RRCS shall be installed in accordance with the standard drawings provided for each visual aid facility. Additionally, regions will have to request from the depot the necessary number of interface control units per FAA-E-2663 for each lighting subsystem which will be controlled by RRCS.

72. DELIVERY. One RRCS was delivered by the contractor to the FAA Technical Center in Atlantic City, New Jersey for system testing on August 28, 1987. When testing is completed at the FAA Technical Center that RRCS equipment will be sent to the FAA Depot. The remaining equipment will be delivered to the FAA Depot and will be available to the regions under the constraints of fiscal year funding. The depot ships equipment to the regions as requests are made and in accordance with the quantities called out in the project status report (PSR).

73. INSTALLATION PLAN. FAA regional engineering offices are responsible for the installation of RRCS equipment. The RRCS equipment will be installed in accordance with national standard drawings and standards revised to fit the individual site. Installation procedures will be executed in accordance with the instruction books provided with the RRCS equipment.

74. CONFIGURATION MANAGEMENT PLAN. Configuration Management (CM) is the process used to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, and record and report change processing and implementation status. Configuration items of concern for this implementation are the switch assembly cabinet, encoding and radio transmission equipment, receiver equipment, decoding equipment and remote radio control equipment hardware baselines. The configuration management discipline shall be applied to all configuration items included in the RRCS baselines to ensure compatibility between elements within the RRCS. All additions and changes to the RRCS baselines shall be proposed in the form of a case file and shall be reviewed for recommended approval or disapproval by a Configuration Control Board (CCB). All changes to the NAS site design baseline and interfaces between the RRCS and the visual aid system must be processed and approved by the Navigation and Landing (APS-400) CCB.

a. Acquisition Phase Configuration Management.

(1) The Navigation and Landing Cluster (APS-400) Configuration Control Board (CCB) controls the establishment of and changes to the RRCS hardware baselines during the acquisition phase. For RRCS matters, the APS-400 CCB will include members from ASM-150, AES-200, ACT-100, AES-500, AFS-200 and the Configuration Management Division, AES-410. The APS-400 CCB is responsible for ensuring that the functional, performance, and interface requirements allocated to the RRCS hardware subsystems are reflected in the baselines, and in any changes to those baselines until product acceptance. The APS-400 CCB is also responsible for ensuring that baseline documentation is accurate and reflects RRCS operational requirements. Baseline documentation includes specifications and interface control documents (ICDs). The APS-400 CCB retains this CM responsibility until the hardware installation is commissioned at each site.

(2) The transition of configuration management responsibilities associated with RRCS hardware products occurs at acceptance by the APS-400 CCB designated representative of the contractor's delivered, installed, integrated, and tested hardware product. Hardware product acceptance is based on successful operational readiness demonstration (ORD) of workstation transmission, encoding, and decoding capability of the equipment.

(3) At product acceptance, the change control functions and CCB records associated with hardware products transition from the APS-400 CCB to the Maintenance Engineering (ASM-100) CCB.

b. Operational Support Phase Configuration Management.

(1) During the operational support phase, and for the entire life-cycle of the implemented hardware enhancements, configuration management functions will consist of
maintenance and change control management of site (Level III Design) as well as product baseline.

(2) The ASM-100 CCB assumes baseline and change control management of the switch assembly cabinet, encoding and radio transmission equipment, receiver equipment, decoding equipment and remote control radio equipment hardware products and associated peripherals as each product is commissioned for operational service (via MOA), and of related NAS site design baselines (including logistics and training). The ASM-100 CCB is responsible for change control management of the RRCS hardware product baseline by MOA. Hardware product baselines are maintained by National Airway Engineering Field Support Sector (ASM-150) personnel in the field. The contractor shall provide engineering changes to ASM-150 when the changes are released, and prior to field implementation. ASM-150 shall evaluate the changes and approve the change for field implementation via case file. The configuration management functions assigned to the ASM-100 CCB are described in the ASM-100 CCB charter.

75.-79. RESERVED.

CHAPTER 8. VERIFICATION

80. FACTORY VERIFICATION. The RRCS equipment contractor performs design qualification and production unit tests using a complete remote radio control system as depicted in figure 8-1 to validate and demonstrate that the RRCS meets the specification requirements of FAA-E-2723.

a. Design Qualification Tests. The contractor conducts design qualification tests to demonstrate that the RRCS system meets every specification requirement through inspection, analysis or actual qualitative or quantitative tests. These tests include equipment visual inspections, environmental tests, systems and spare parts tests, transient suppression tests, interference tests, and the specified tests for the transmitter, receiver and antenna.

b. Production Unit Tests. Production unit tests for the RRCS include visual inspections, functional tests, and timed systems tests for every production unit. Any erratic switching, loss of control or operation outside prescribed limits is cause for rejection of the unit.

81. CHECKOUT. After installation of equipment by the regions, FAA personnel conduct checkout tests in accordance with the contractor developed equipment instructional books. The procedures followed include testing electrical and mechanical hardware interfaces and verifying system performance and operation of spare parts.

82. CONTRACTOR INTEGRATION TESTING. Not applicable. See paragraph 84.

83. CONTRACTOR ACCEPTANCE INSPECTION (CAI). Inspection of the RRCS is performed at the contractor's facility. Quality control inspections are performed by the Quality/Reliability Officer (QRO) in accordance with FAA requirements. All equipment is accepted at the contractor's facility following successful completion of production tests.

84. FAA INTEGRATION TESTING. Integration testing is conducted by the FAA regional office upon installation of the RRCS and visual aids prior to recommendations for systems acceptance.

85. SHAKEDOWN AND CHANGEOVER. Shakedown testing is performed by FAA regional personnel at the RRCS site to determine that the RRCS is ready for full operation as part of the NAS. After the successful completion of JAI, and commissioning, the local AF maintenance representative assumes responsibility.

86. JOINT ACCEPTANCE INSPECTION (JAI). A joint acceptance inspection is conducted in accordance with FAA Order 6030.45, Facility Reference Data File to gain the consensus of involved office that the RRCS project has been completed in accordance with applicable standards and specifications and that the facilities are capable of providing the services required within established standards and tolerances. The JAI ensures compliance with requirements in the following areas:

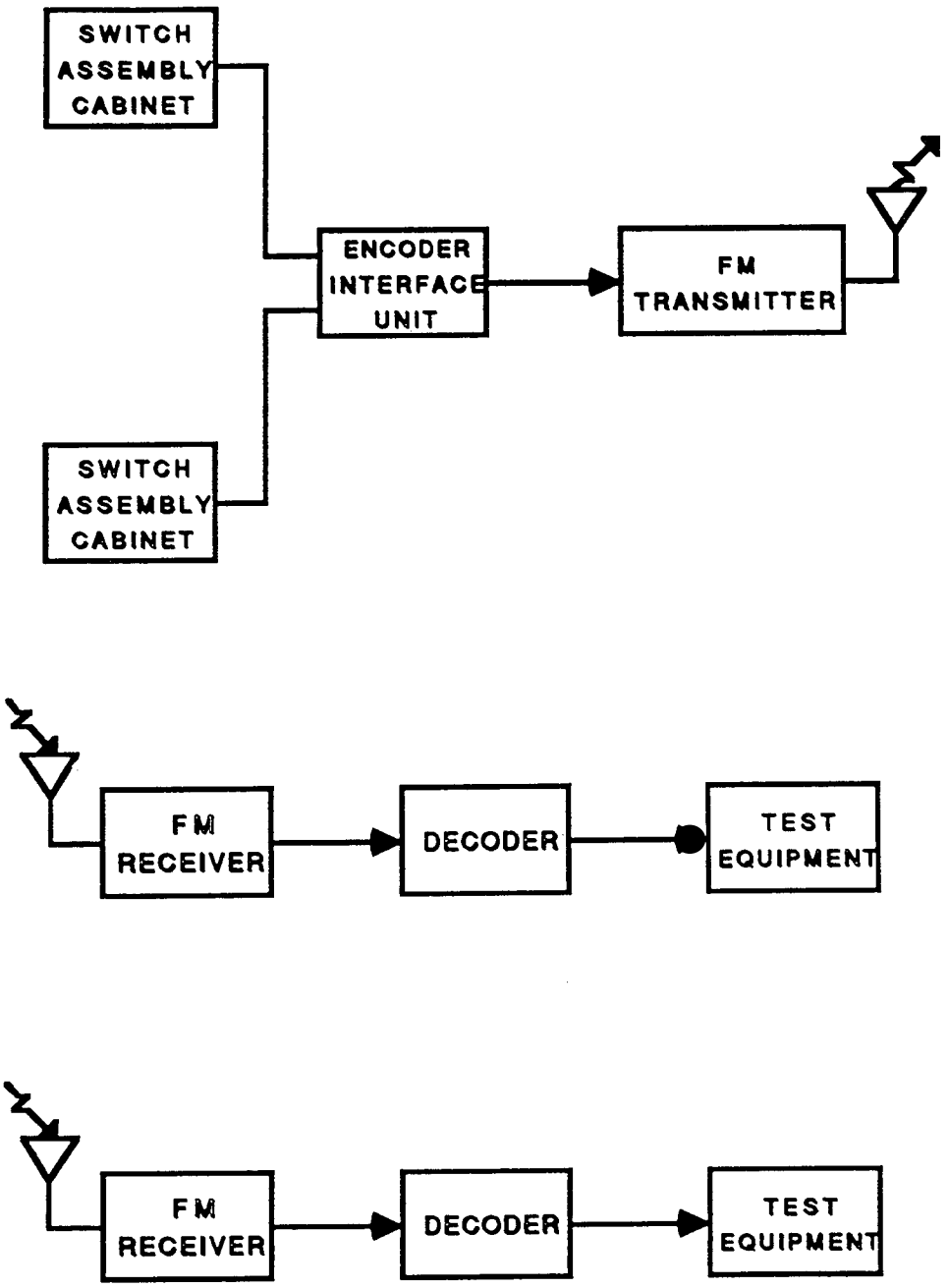

FIGURE 8-1. OPERATIONAL TEST SETUP

a. Facility Construction and Equipment Installation.

b. Facility/System/Equipment Performance.

c. Facility Technical Performance Documentation and Maintenance Reference Data.

d. Facility Logistics Support.

e. Final Acceptance and Commissioning.

87.-89. RESERVED.

CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

90. Maintenance Concept. The RRCS is supported by both site and depot maintenance. The FAA is responsible for the maintenance of RRCS equipment. FAA regions assign personnel to AF sectors where work centers, defined by geographic and personnel skill capabilities, are responsible for the onsite maintenance of RRCS facilities.

a. Site Maintenance. Site maintenance technicians (either FAA and/or contractor) will replace RRCS components down to the lowest replaceable units (LRU) and may perform limited repair/corrective and preventive maintenance functions as required, onsite.

b. Depot Maintenance. Depot maintenance will consist of receipt and repair/replacement of failed LRUs. These functions can be performed by either the FAA and/or a commercial contractor.

91. Training. The training program for the RRCS project is outlined in the RRCS Subsystem Training Plan (STP). Assignment of training quotas for the regions will be made by ASM-210 for Airway Facilities (AF) personnel. Projected training requirements for individual work centers/facilities and principle training milestones are included in this training plan. Training for the RRCS project is being evaluated to determine if contractor training is required for FAA personnel or if knowledge of transmitters/receivers will be sufficient to support the RRCS project.

92. Support Tools and Test Equipment. Special tools and test equipment required for initial adjustments, installation and modifications to the RRCS are provided by the government. The contractor provides the FAA a tool list, and test equipment and characteristic data required for the government to obtain the tools and test equipment. Test equipment is supported at the AF sector office having responsibility for the visual aid facility and as called out in FAA Order 6200.4C, Test Equipment Management Handbook.

93. Supply Support. The FAA Depot, in conjunction with ALG-200 will develope a coding structure compatible with the National Stock Number system to be used to catalog system components, LRUs, and expendable parts and supplies. In addition, the FAA Depot will provide supply support.

94. Vendor Data and Technical Manuals. Instruction books for the RRCS are provided by the contractor and reviewed by the FAA prior to acceptance. Instruction books are provided with each RRCS delivered. Other technical documentation to be provided by the contractor include provisioning technical documentation, master patterns, test equipment and characteristic data, tool list, program data for ROMS/PROMS and reprocurement data package drawings.

95. Equipment Removal. At locations where there is an existing ground-to-ground radio control system, there will be two separate

ground-to-ground radio control systems after the RRCS is installed. The existing ground-to-ground radio control system will be removed under the RRCS Retrofit Program when funding from the budget is available.

96. Facilities. Not applicable.

97.-99. RESERVED.